# Current Practices of FM and Sound Field Amplification Systems in Preschool Classrooms

Bridget Poole, B.S.
Lauri Nelson, Ph.D.
Karen Munoz, Ed.D.

# Introduction

- Approx 12,000 children per year in U.S. born with permanent hearing loss (Niparko, 2000)
- Importance of early identification and early intervention is well documented
- Consistent use of hearing aids and/or cochlear implants important for spoken language development

# Preschool Population

- Busy classrooms – background noise and physical distance from teacher
- Noise level in preschool classrooms range from 34 to 73 dBA (Schafer & Thibodeau, 2006)
- Suboptimal auditory input can impact speech, language, and literacy development

# FM Technology Research

- Most research involves school-age children or adults
- Evidence supports the benefits of using personal FM systems and sound field FM technology for
  - Improved signal-to-noise ratio
  - Improved classroom acoustics
  - Improved listening and learning behaviors
  - Improved phoneme and speech recognition

# For example…

- Anderson and Goldstein (2004)
  - Desktop and personal FM systems benefit over use of hearing aids alone.
  - Provided improvements in speech recognition scores in noise.

- Rosenberg et al. (1999)
  - 3-yr longitudinal study to evaluate impact of SF systems
  - Found improved outcomes with FM use
  - Improvements in listening and learning behaviors and skills
  - Youngest children showed greatest improvement

# Research with Preschool Children

- Fewer studies are available that provide guidance for using FM technology in preschool children
- For example:
  - (Schafer & Thibodeau, 2006)
    - 22 study participants
    - Age range:  3 – 12 years
    - 6/22 participants were preschool age (3 to <5)
    - Study evaluated bilateral, bimodal, and personal FM configurations
    - Children with CIs had better speech recognition in noise with FM system on one or both sides compared with CI alone.

# Research with Preschool Children

- Some studies have focused on using FM technology in the home or other non-academic settings:
- For example:
  - Moeller, et. al. (1996)
    - Evaluated effects on language development with FM use in non-academic settings
    - 2-yr longitudinal study
    - 10 study participants (8 with hearing loss; 2 normal hearing)
    - Age range at study onset: 2-4 years
    - Three study groups: FM **or** HA; HA only; FM only for NH subjects
    - Obtained language, grammar, and listening outcomes
    - Although no statistically significant differences between the FM and HA groups were found, benefits of using FM in specific listening situations were reported
    - None preferred FM systems as primary amplification

# Research with Preschool Children

- Benoit (1989)
  - Evaluated FM use in the home
  - 1-yr study
  - 10 study participants
  - Age range at study onset:  1;1 to 3;5 years
  - All participants:  binaural BTE + FM system
  - Reported increased interaction between parent and child
  - Increase in language stimulation and word imitation
  - Not all children accepted the FM

# Question

- What is the prevalence of sound field or personal FM use with preschool-age children?
- What are the challenges or barriers?
- What are the potential benefits?
- What are the experiences and recommendations of teachers?

# Survey Methods

- Participants:
  - Preschool teachers of children who are deaf or hard of hearing
    - Public and private schools
    - Geographical spread to get representative sample across U.S.
    - Phone calls made to inquire about participation
    - Surveys sent to centers who indicated willingness to participate
  - Approximately 306 surveys mailed to 124 centers contacted by phone. Another 76 surveys mailed to 38 more schools unable to contact by phone
  - 32% return rate (based on centers who agreed to participate)

# Survey Results

- 99 surveys were returned
- Communication methodology used
  - Listening and Spoken Language: 65%
  - Bilingual/Bicultural (ASL/English): 19%
  - Total Communication: 16%
- Surveys completed by
  - Classroom teacher: 76%
  - Other (e.g., school director): 22%
  - Teacher aide: 5%

# Survey Results

- Program type
  - Private program:  56%
  - State school for the deaf:  28%
  - Public school program:  8%
  - Other:  10%
- Average number of children per classroom
  - Total of all programs:  7.9
  - LSL programs:  8.4
  - Bi/Bi programs:  6.7
  - TC programs:  7.5

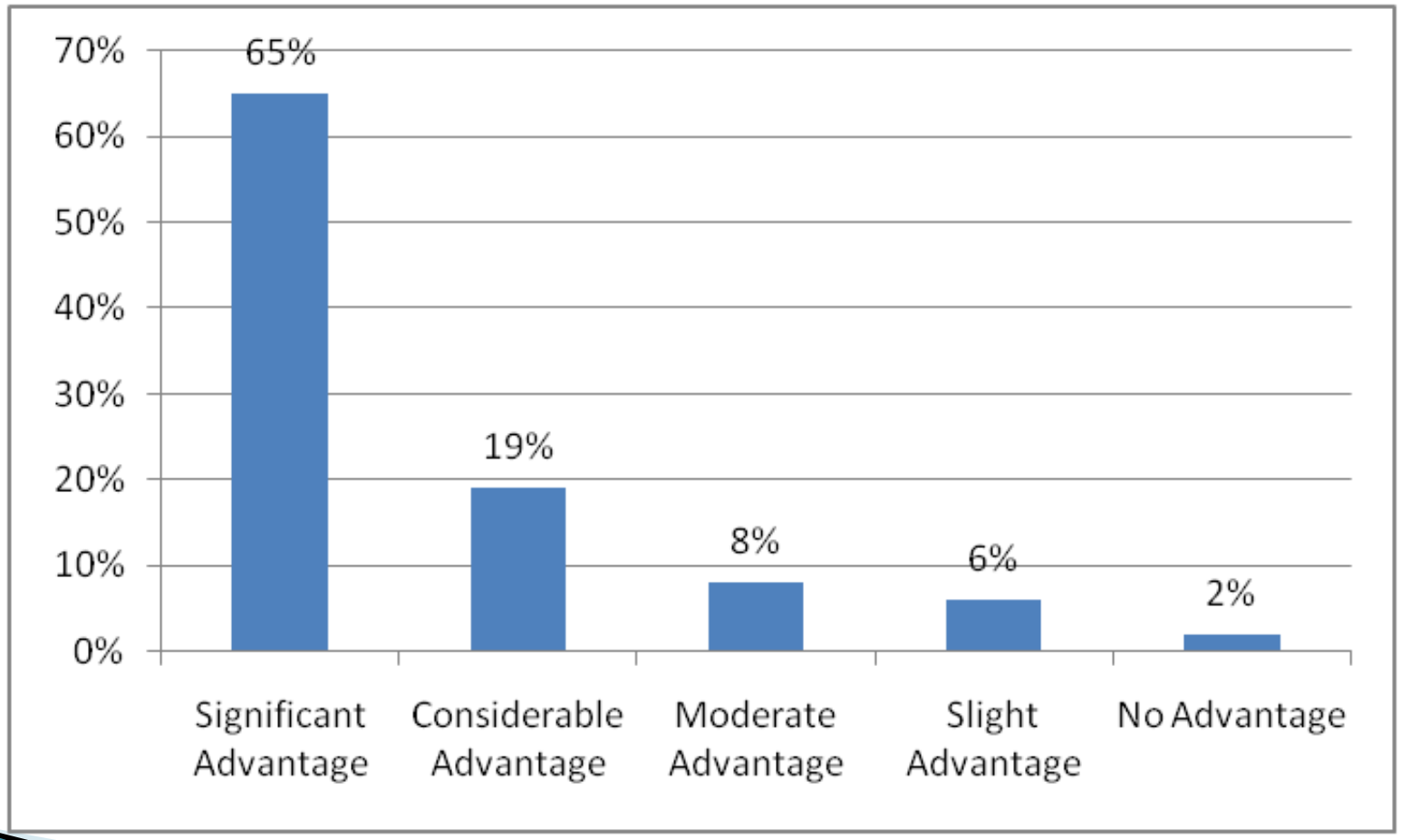
# Sound Field Systems

# Survey Results

- Percentage of classrooms that use sound field FM systems:
  - Total of all programs:  56%
    - LSL programs:  67%
    - Bi/Bi programs:  11%
    - TC programs:  63%

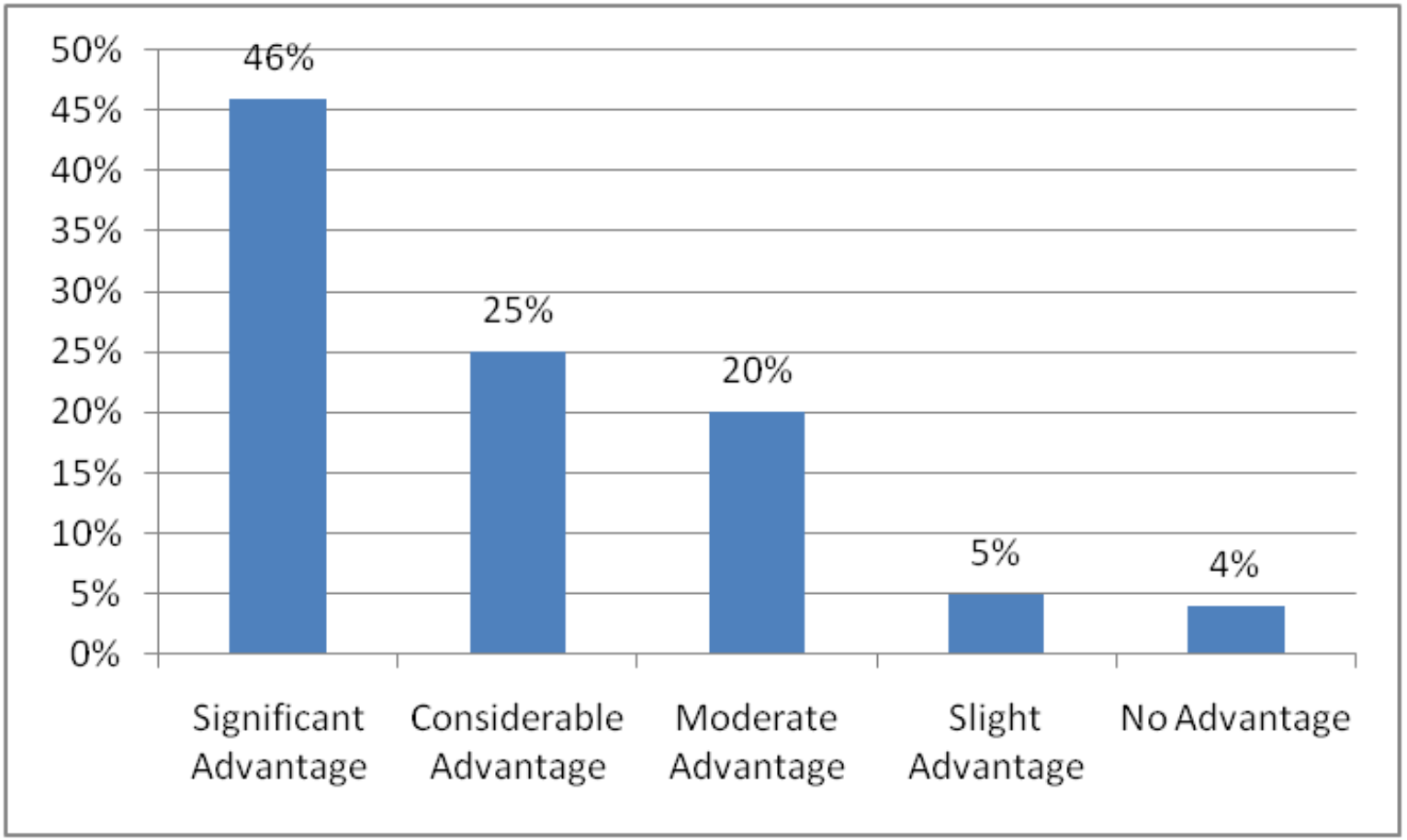
# Advantages of Sound Field Systems

## Increased Student Attention



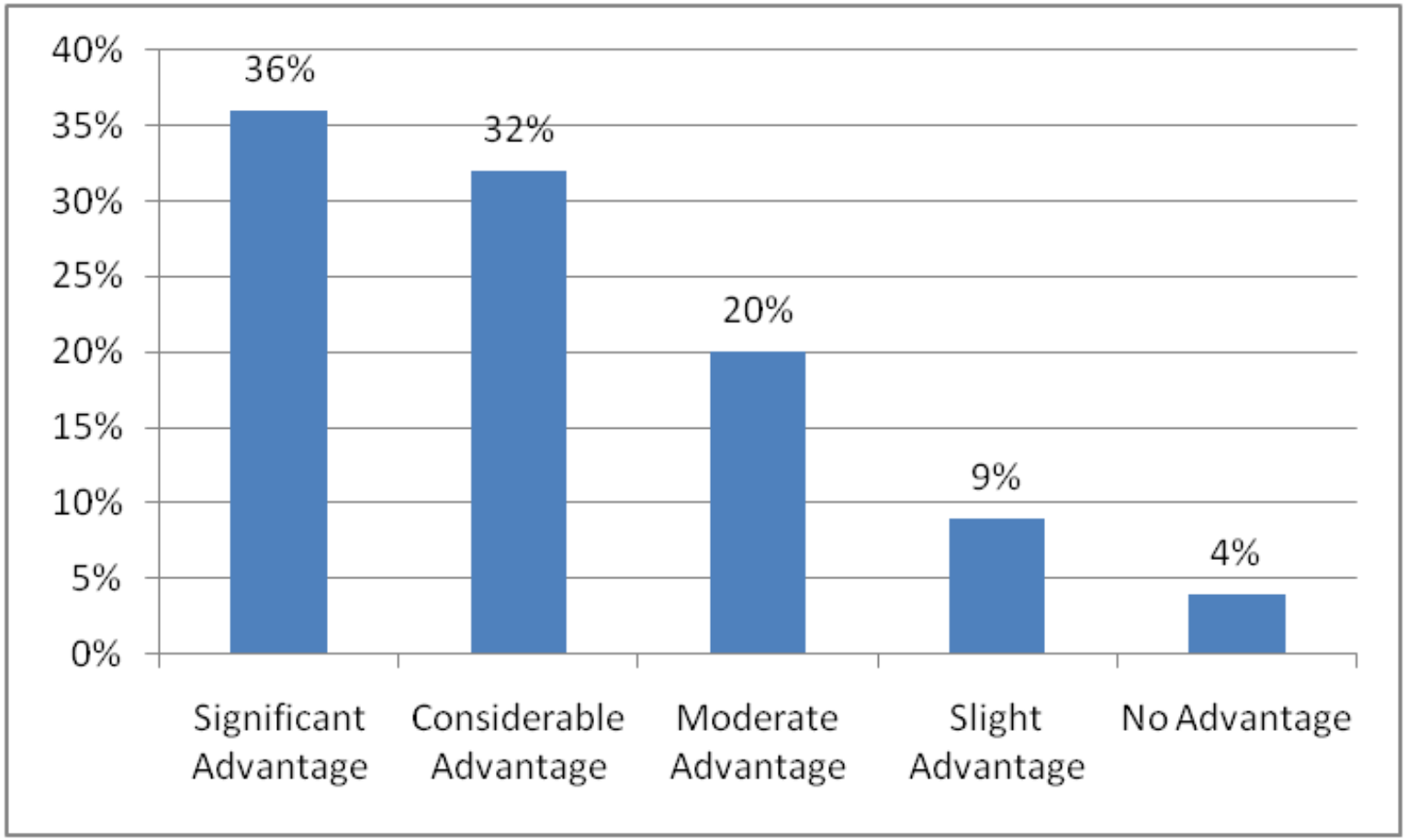
# Advantages of Sound Field Systems

## Improved Academic Performance



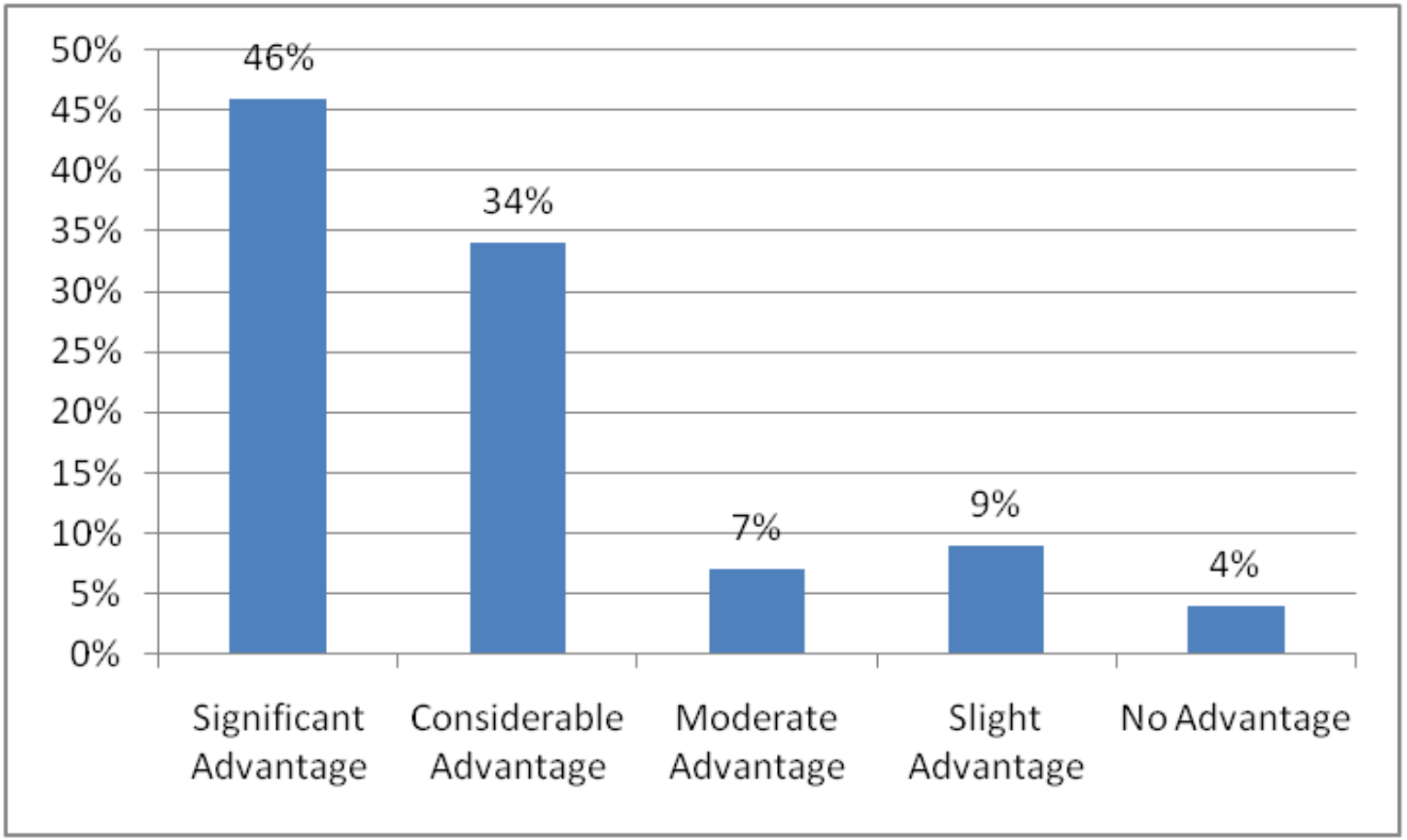
# Advantages of Sound Field Systems

## Improved Student Behavior



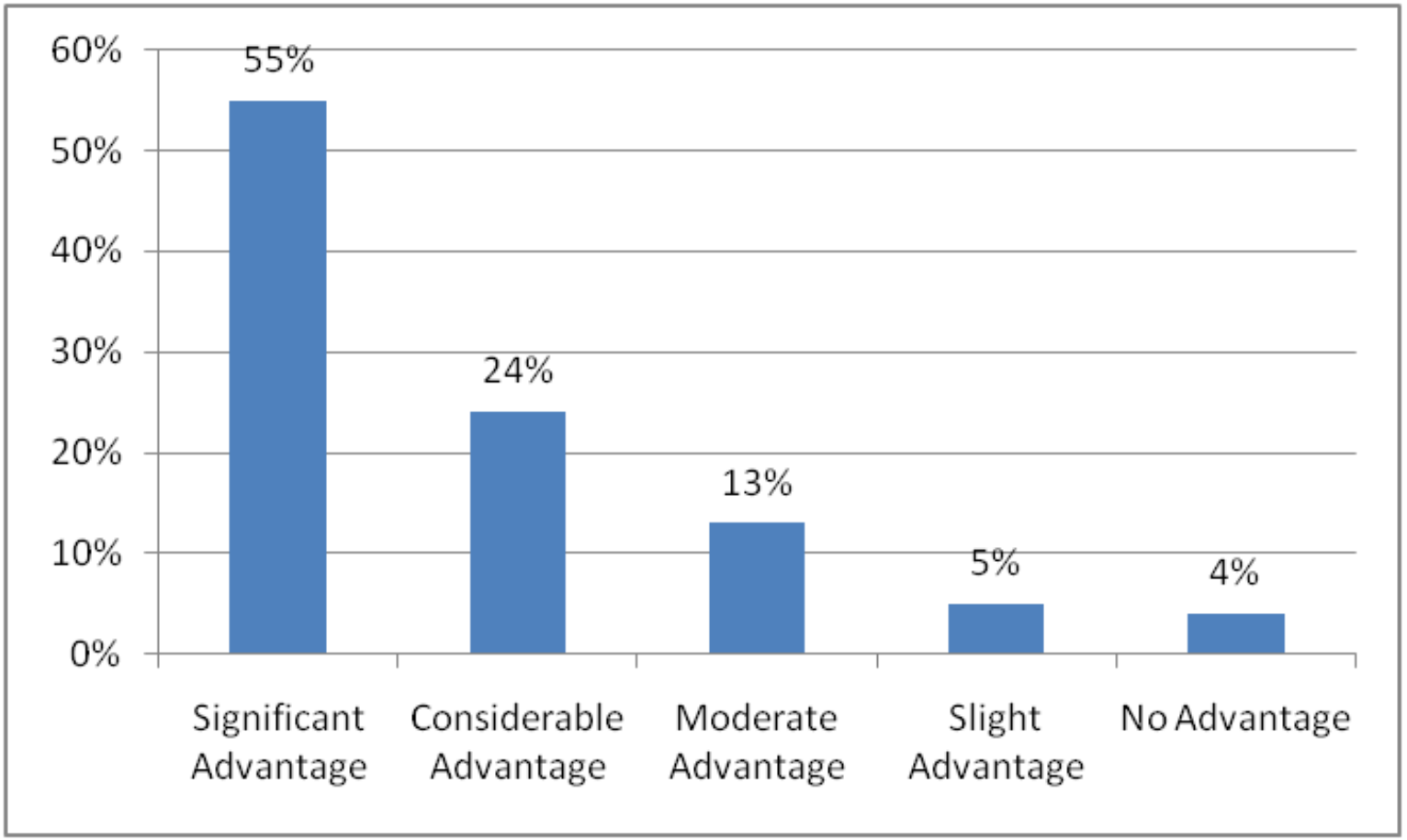
# Advantages of Sound Field Systems

## Improved Language Development



# Advantages of Sound Field Systems

## Reduced Strain of Teacher's Voice

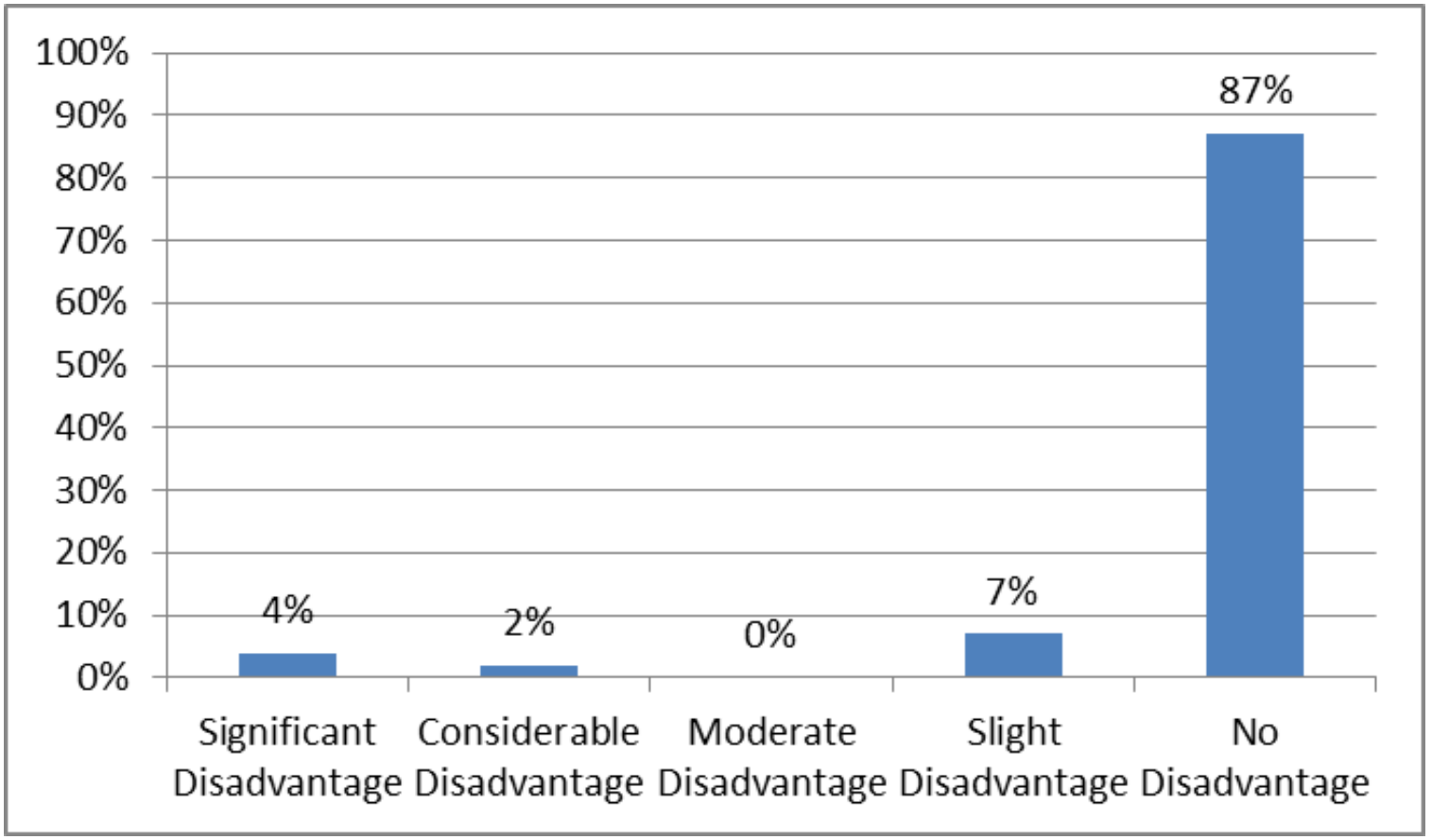


# Advantages of Sound Field Systems – Open Comments (verbatim):

- Improved ease of communication
- Improved signal to noise ratio
- Benefits for hearing students as well
- Improved articulation

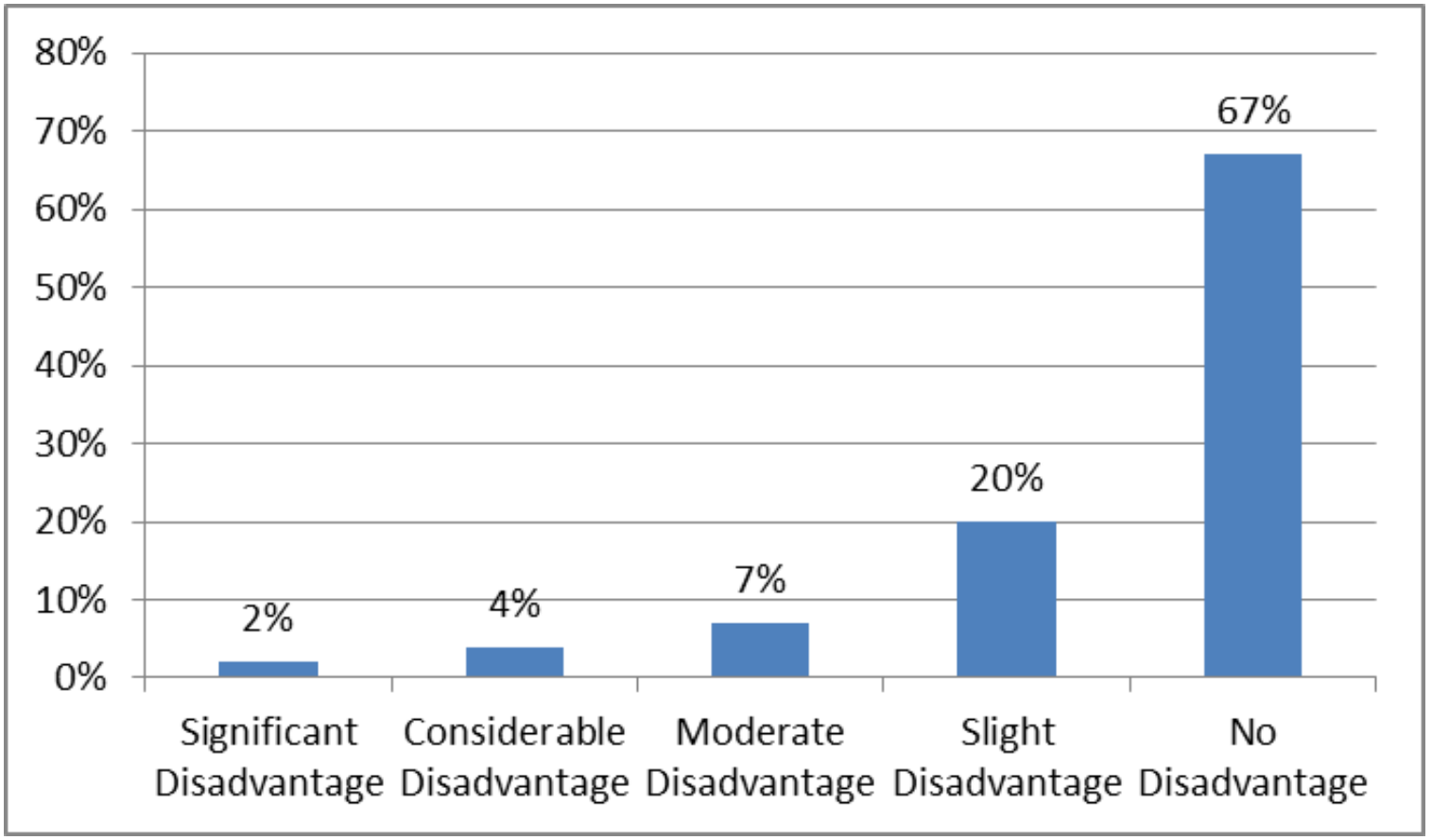
# Disadvantages of Sound Field Systems

## Distracts Students



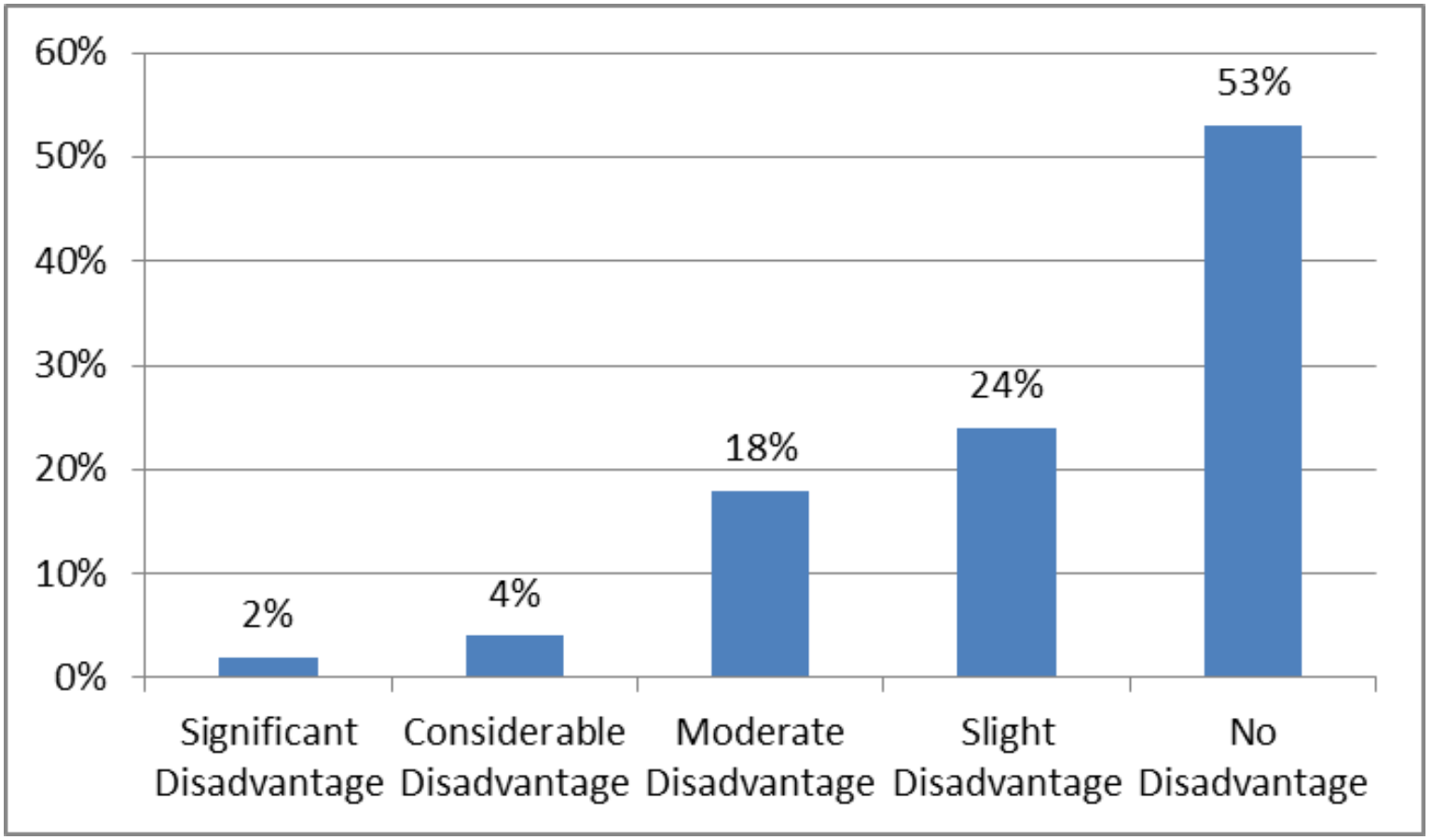
# Disadvantages of Sound Field Systems

## Poor Sound Quality



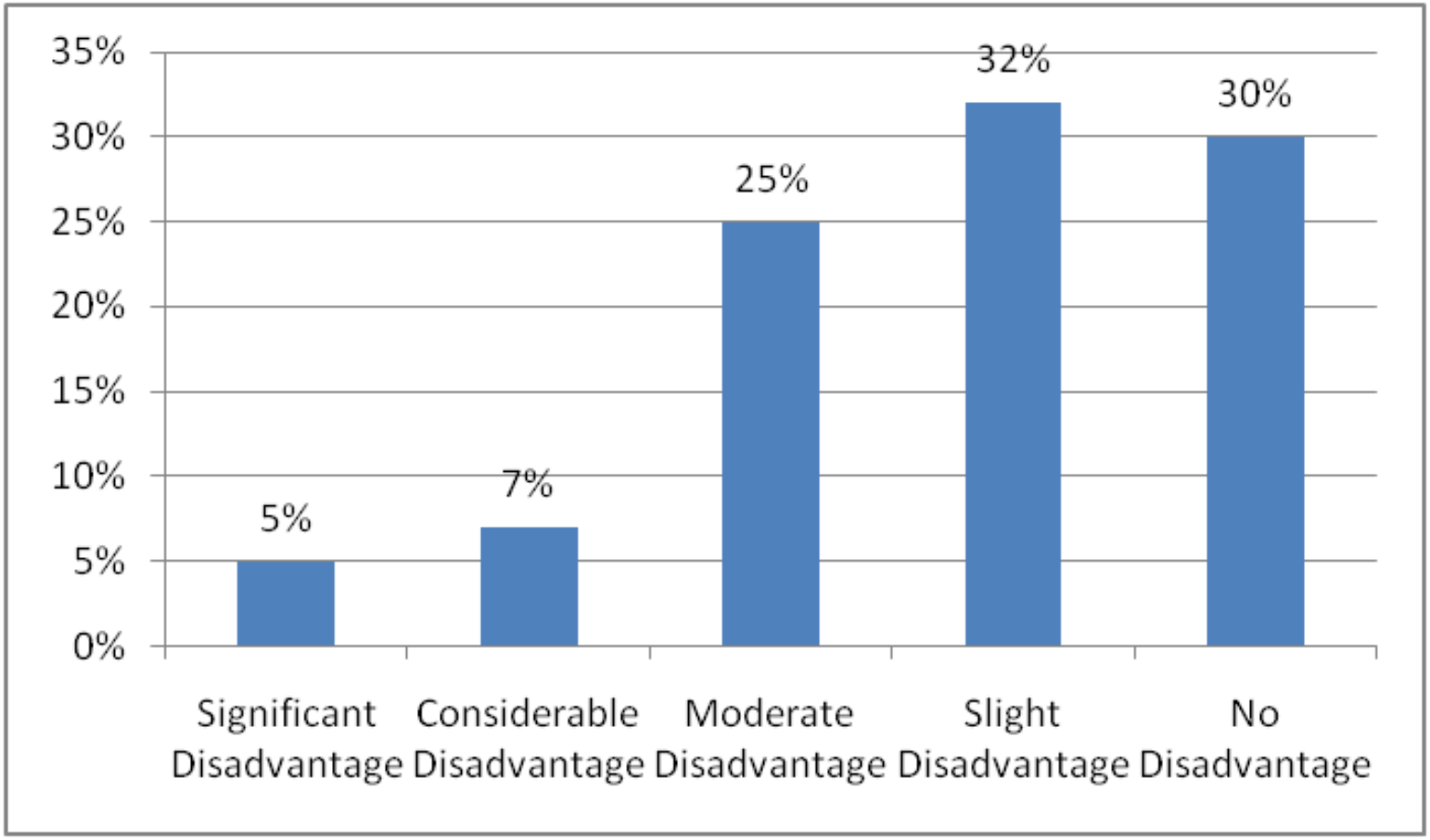
# Disadvantages of Sound Field Systems

## Uncomfortable for Teacher to Wear



# Disadvantages of Sound Field Systems

## Acoustic Feedback/Technical Difficulties



# Disadvantages of Sound Field Systems – Open Comments (verbatim):

- Can’t use with center-based learning
- Not beneficial for small group work
- Disadvantage when developing listening skills at a distance
- It bothers students who don’t need it
- Difficulty balancing loudness and directionality

# Personal FM Systems

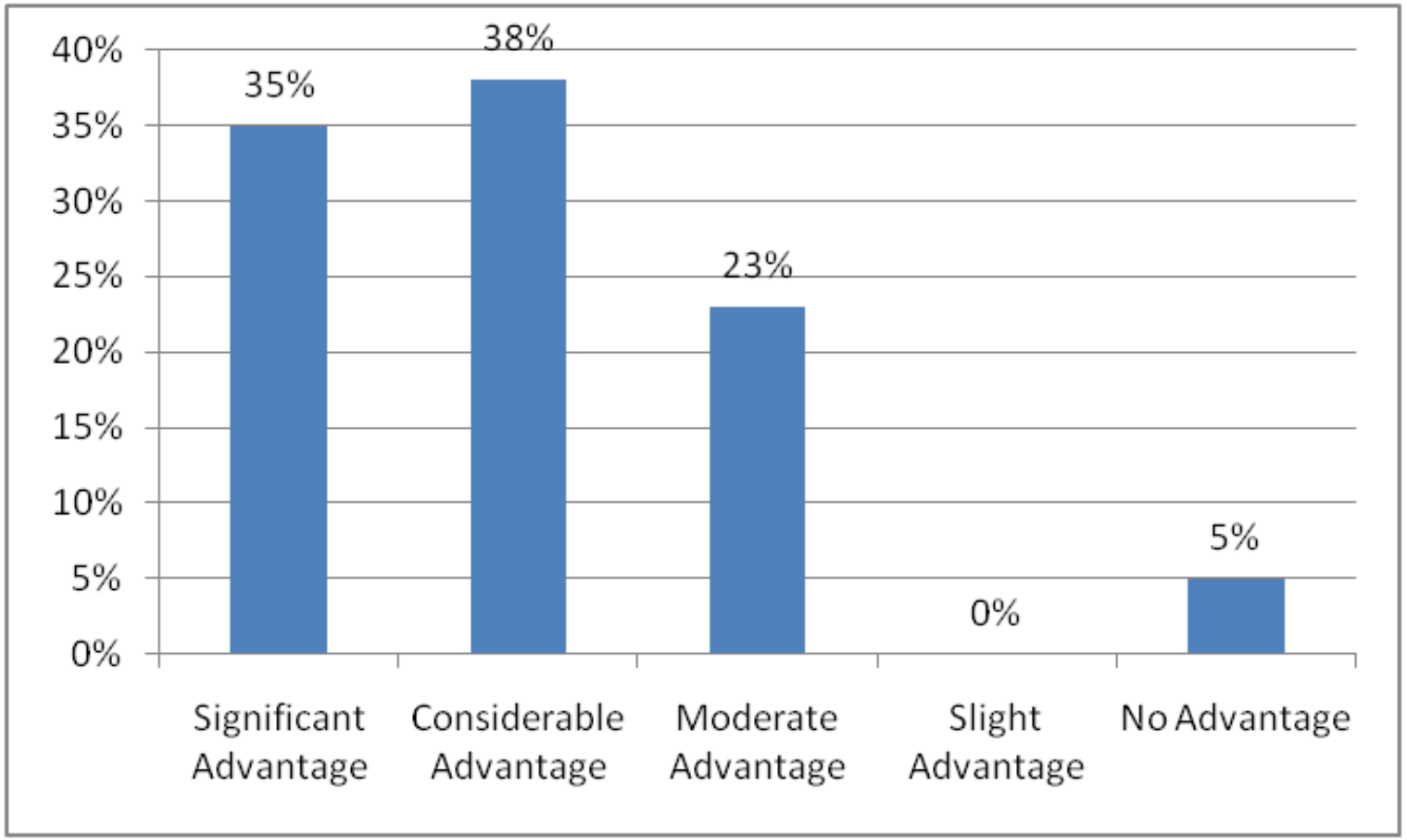
# Survey Results

- Total percentage of children by age who use a personal FM system:
  - Age 3: 18%
  - Age 4: 23%
  - Age 5: 27%

- Percentage of respondents that reported one or more child in the class who uses a personal FM system:
  - Age 3: 31%
  - Age 4: 41%
  - Age 5: 29%

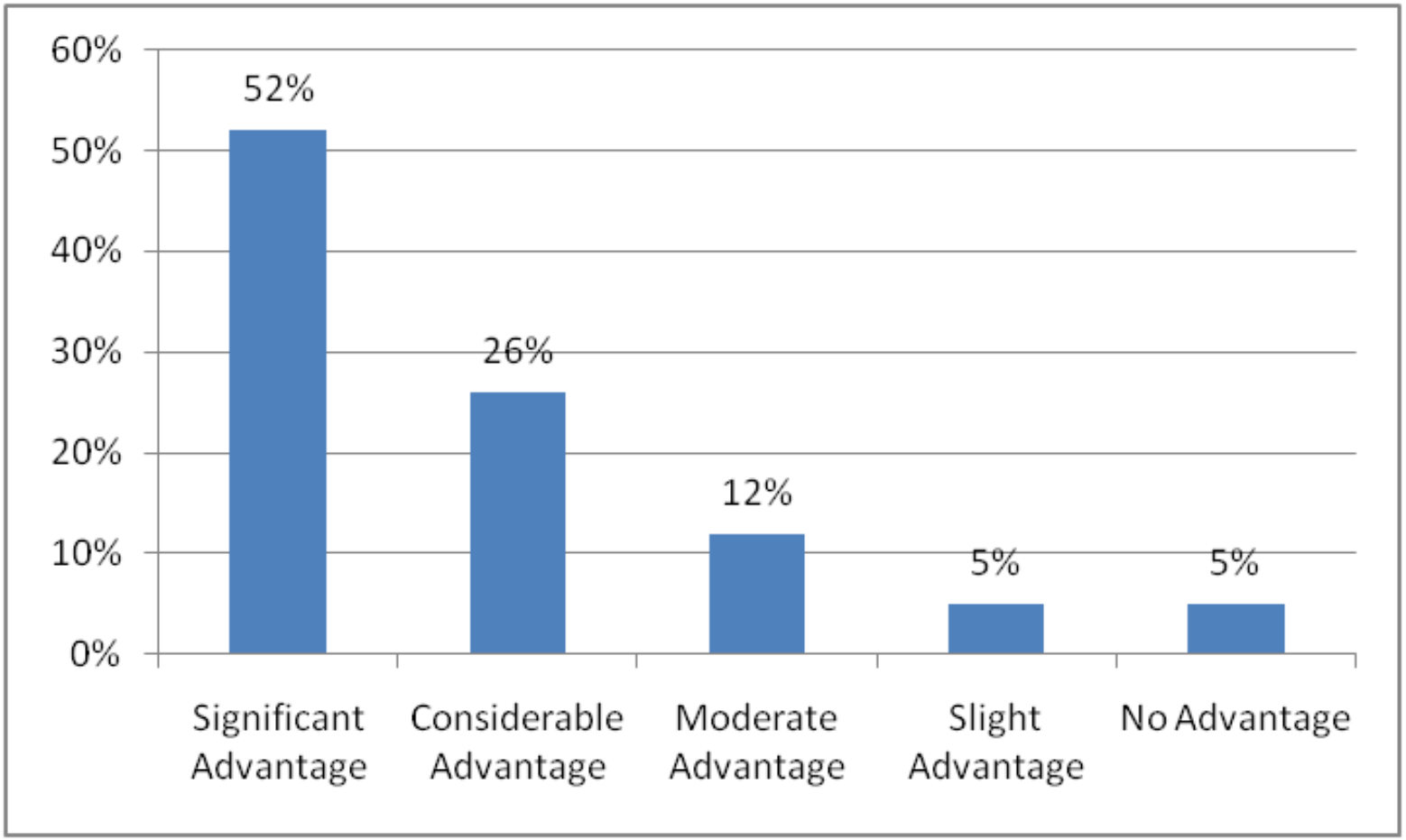
# Advantages of Personal FM Systems

## Improved Academic Performance



# Advantages of Personal FM Systems

## Improved Speech and Language



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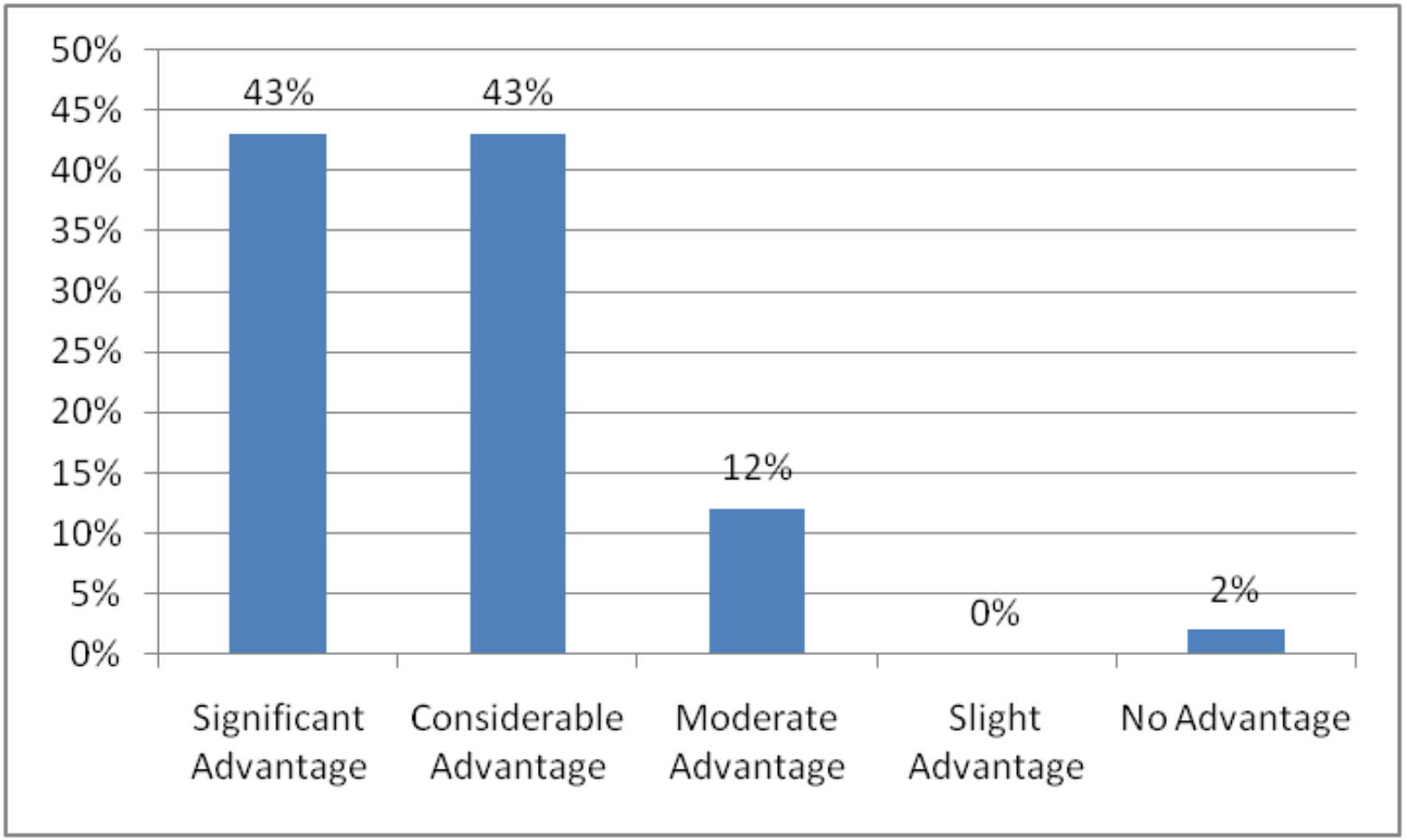
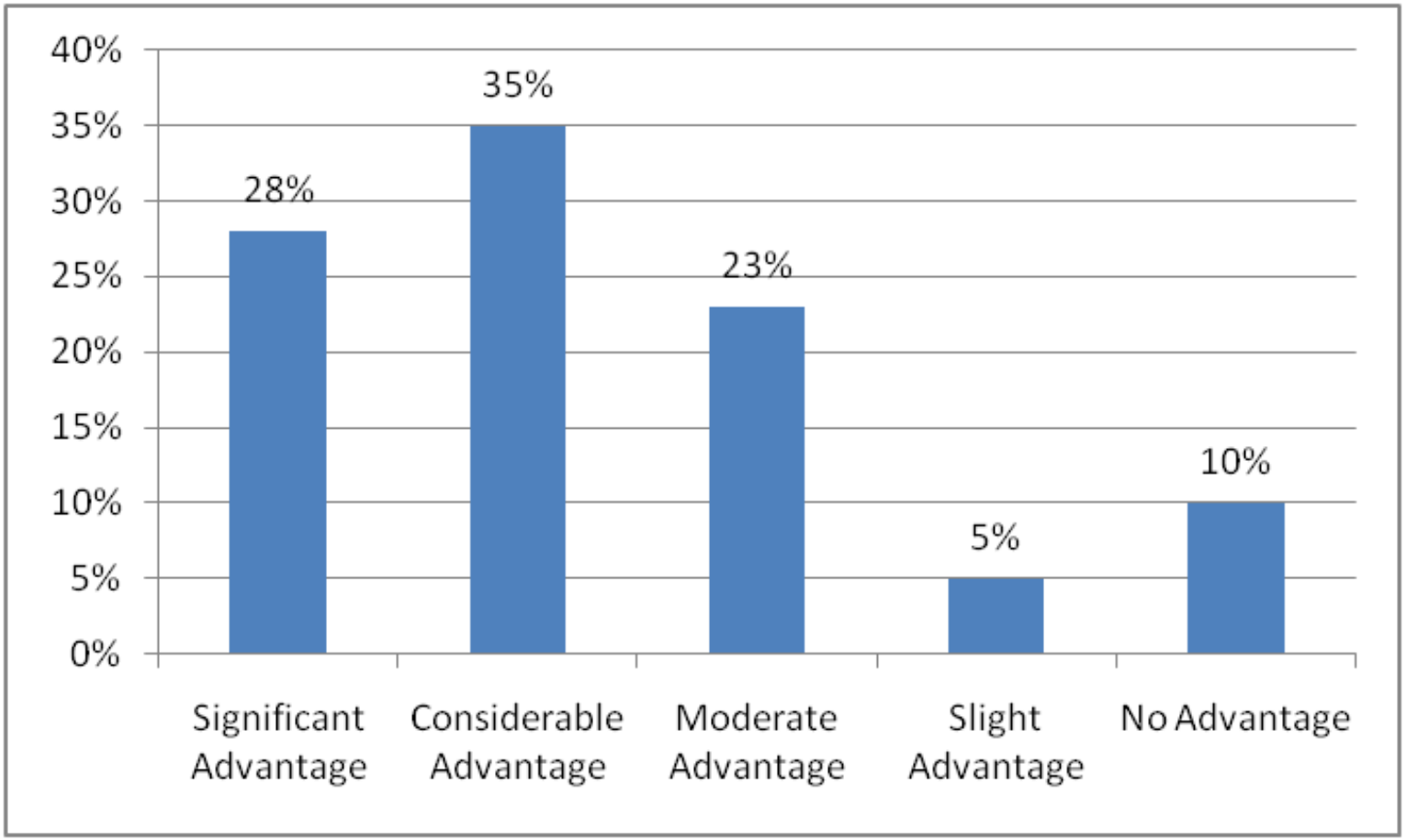


# Advantages of Personal FM Systems

## Improved Student Behavior

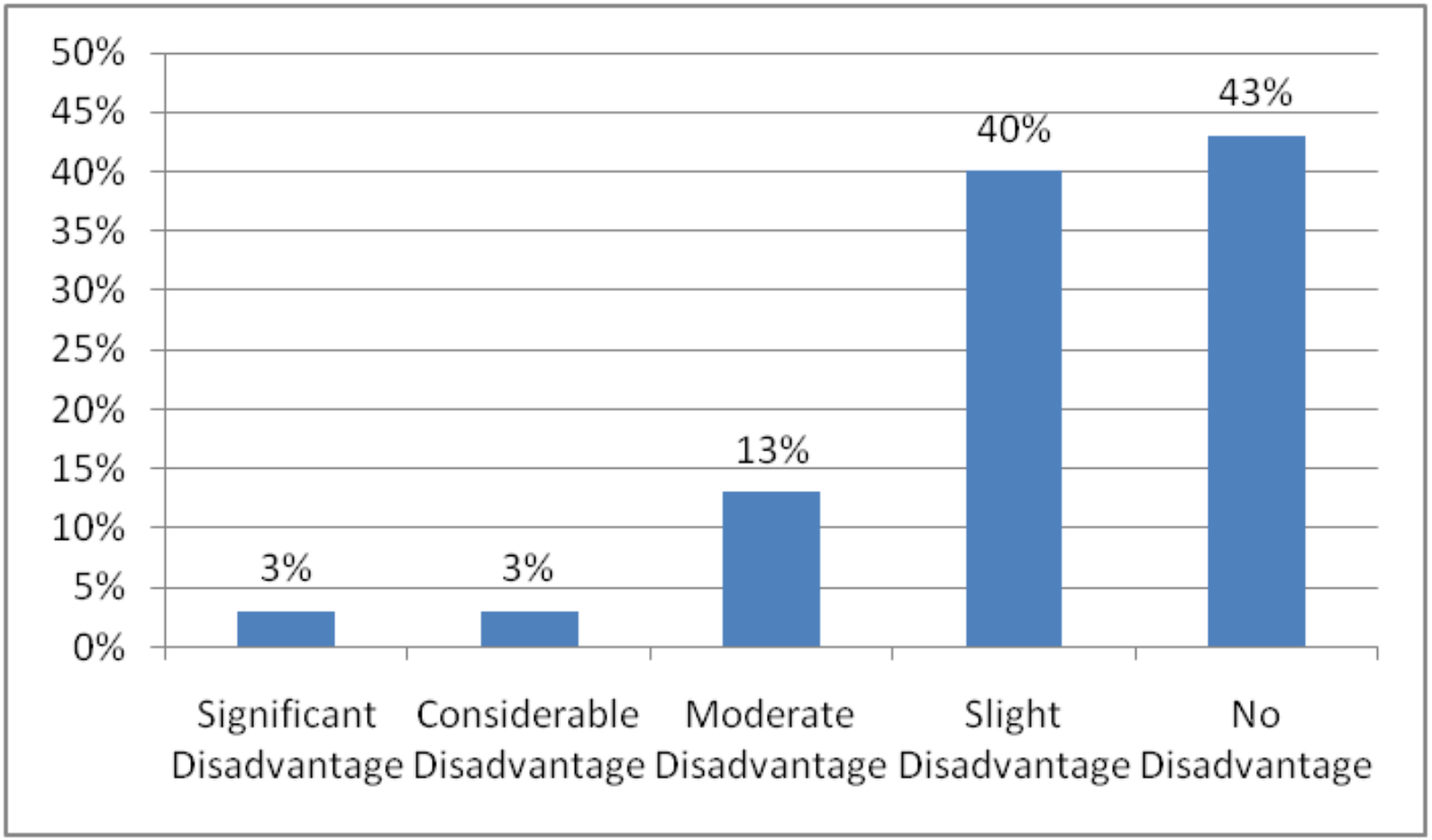


# Advantages of Personal FM Systems – Open Comments (verbatim):

- This is very individual and may differ from one child to another
- Audist based survey- what does that mean? Do you mean that language development in spoken English only? ASL is also language! Please revise this question so that it is more inclusion to all Deaf and Hard of Hearing Students.

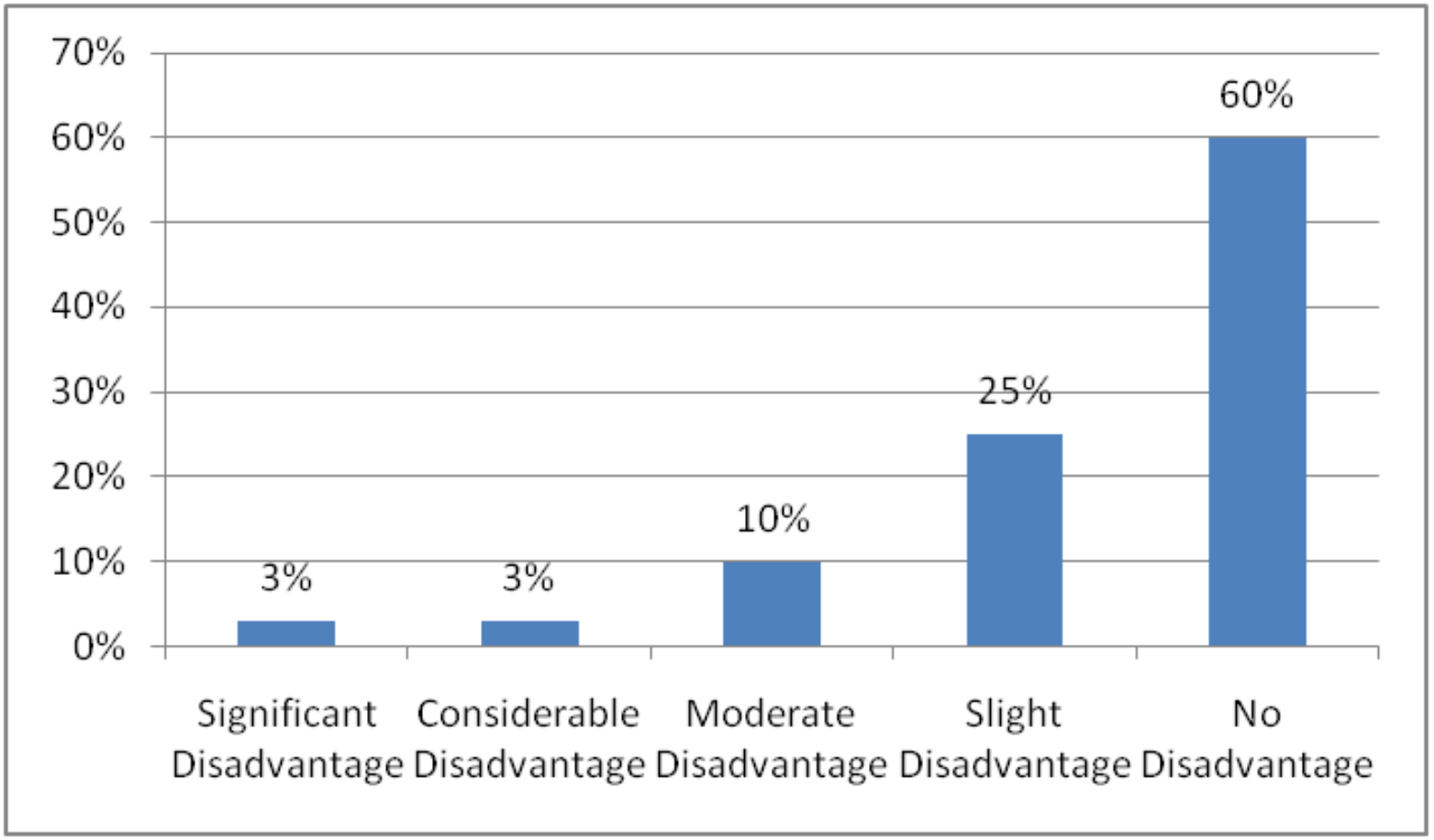
# Disadvantages of Personal FM Systems

## Cannot Hear Classmates



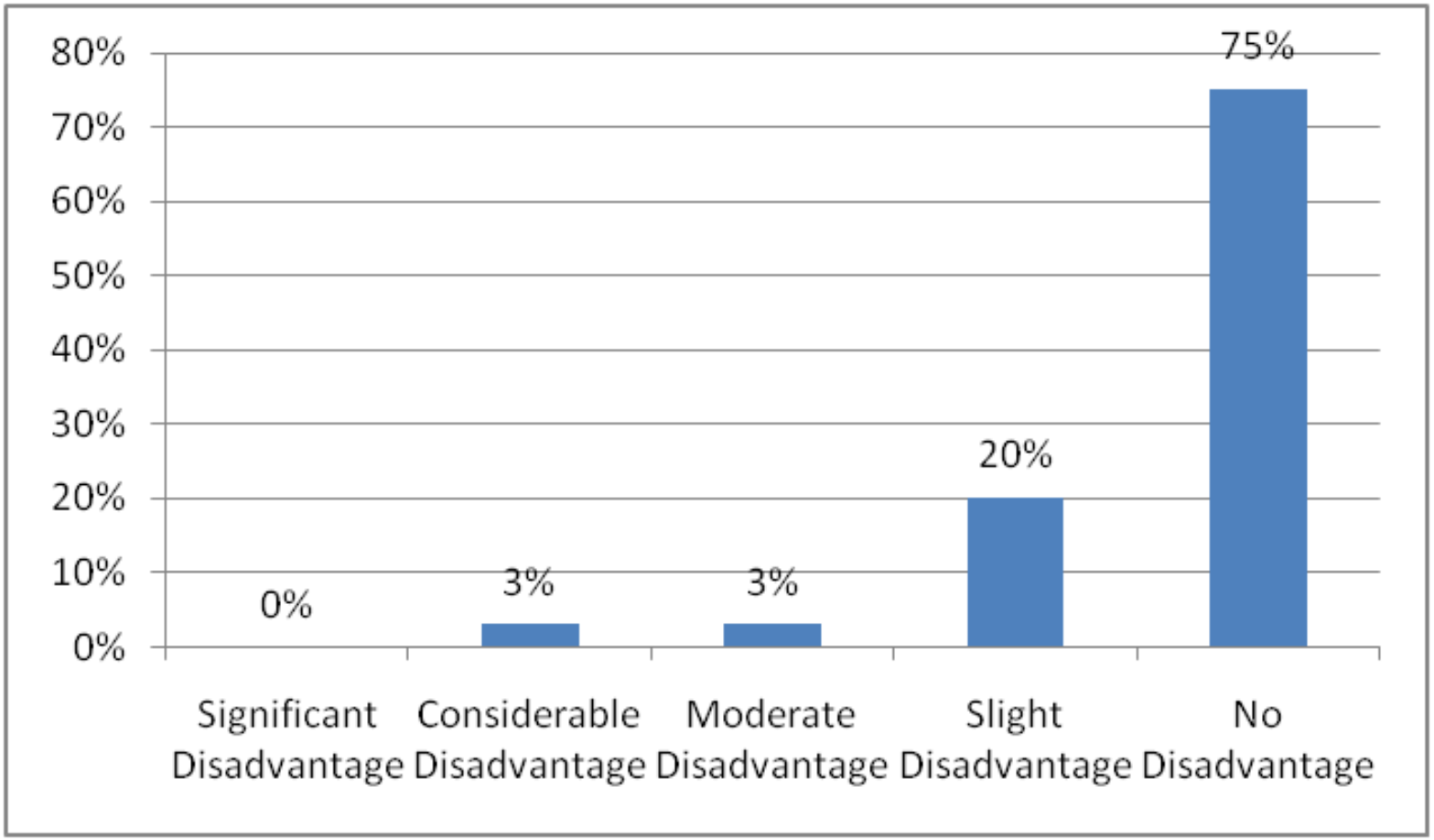
# Disadvantages of Personal FM Systems

## Uncomfortable to Wear



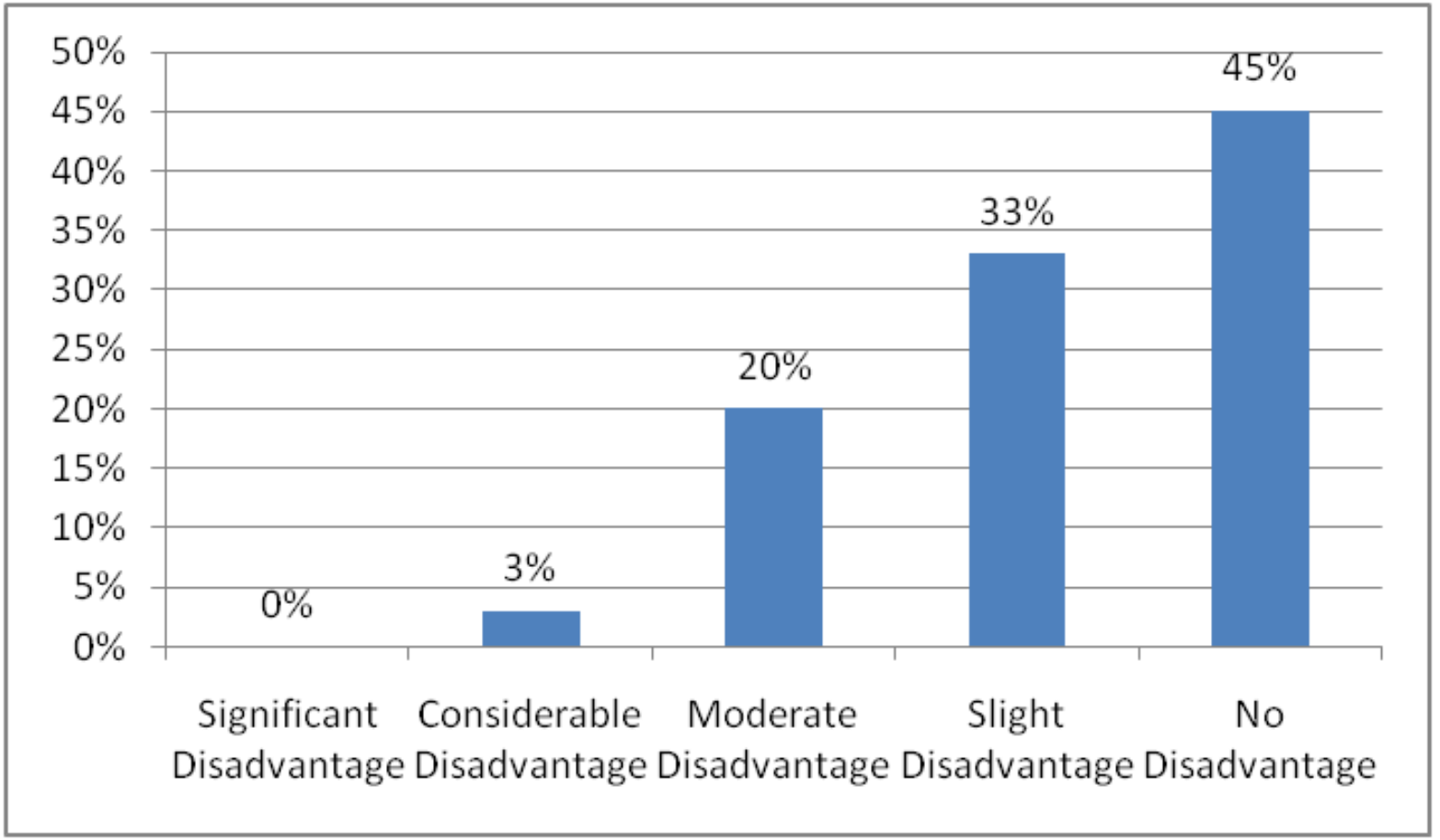
# Disadvantages of Personal FM Systems

## Distracts Students



# Disadvantages of Personal FM Systems

## Hard to Use/Technical Difficulties

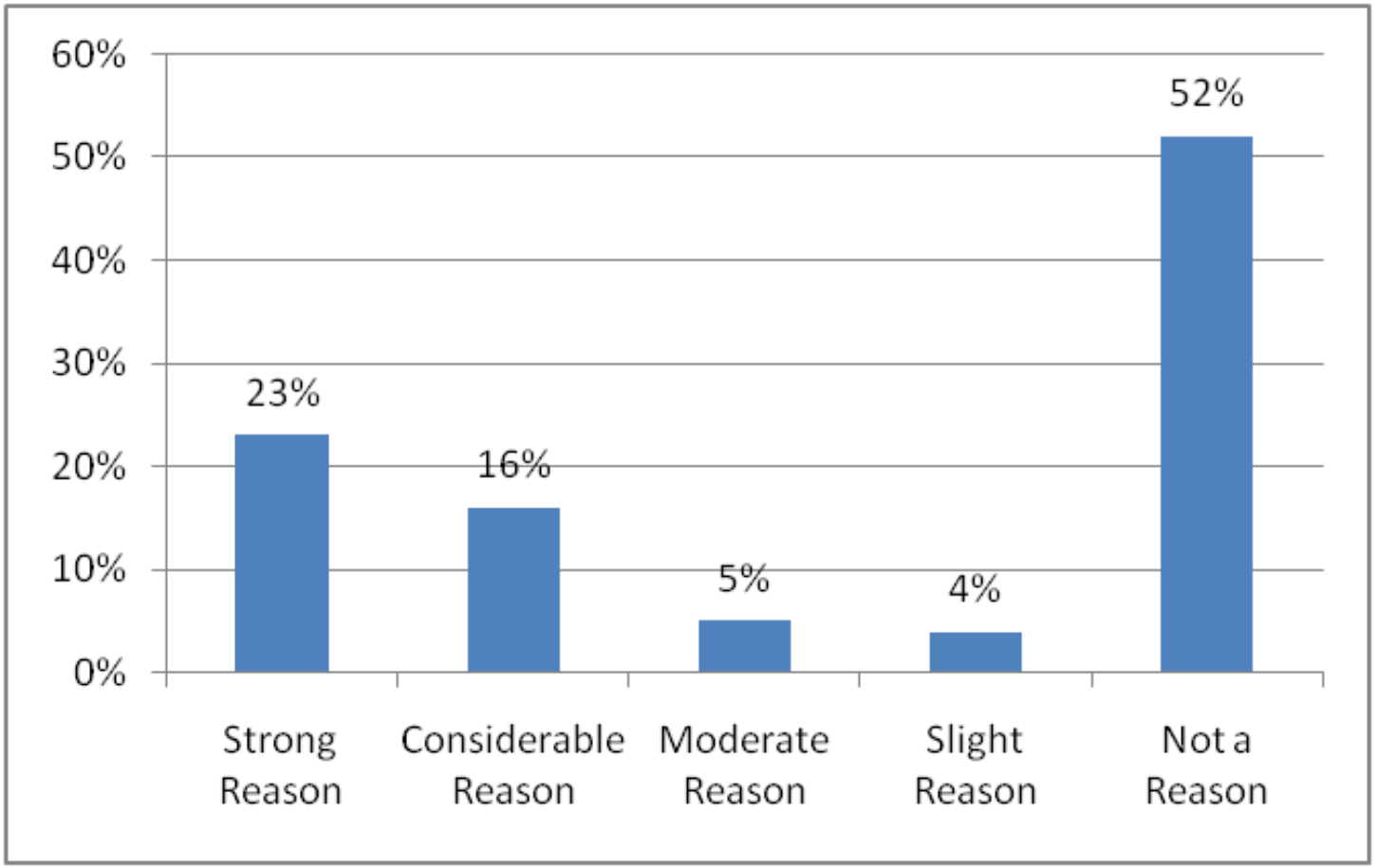


# Disadvantages of Personal FM Systems – Open Comments (verbatim):

- Students who gain additional environmental sounds become more vocal

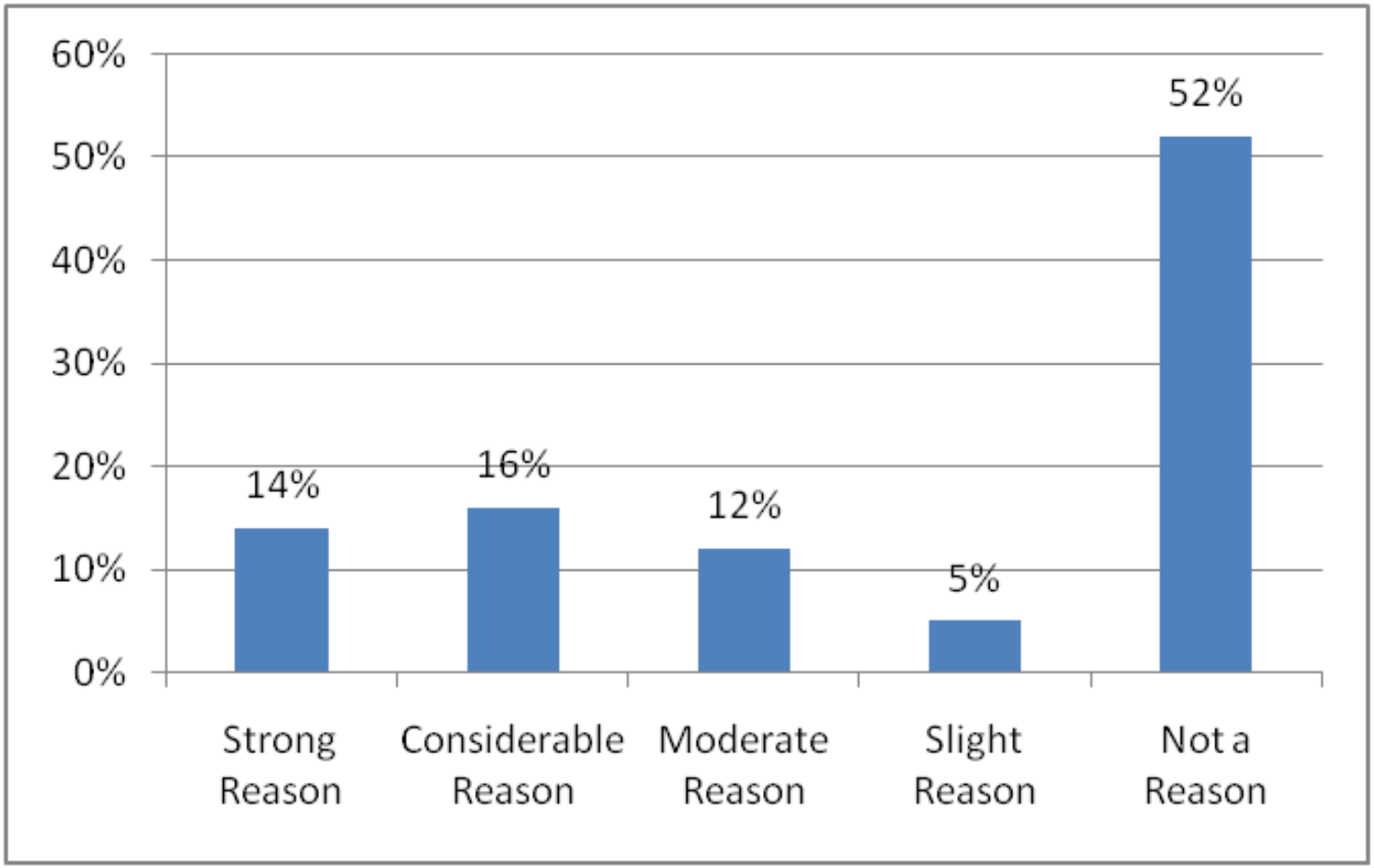
# Reasons Children Do Not use Personal FM Systems

## Too Young/Unable to Report Difficulties



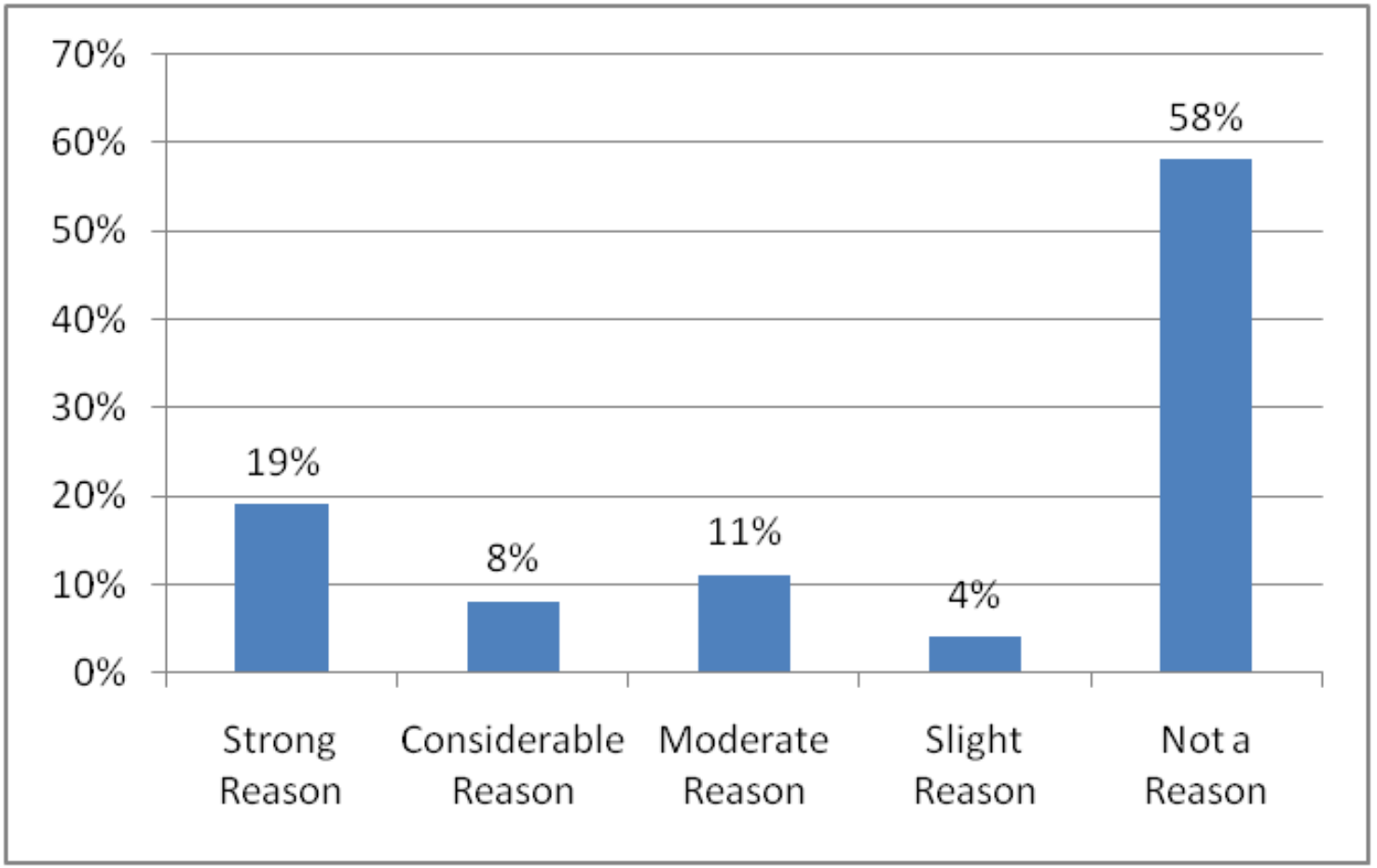
# Reasons Children Do Not use Personal FM Systems

## Funding/Costs



# Reasons Children Do Not use Personal FM Systems

## Insufficient Benefit from FM



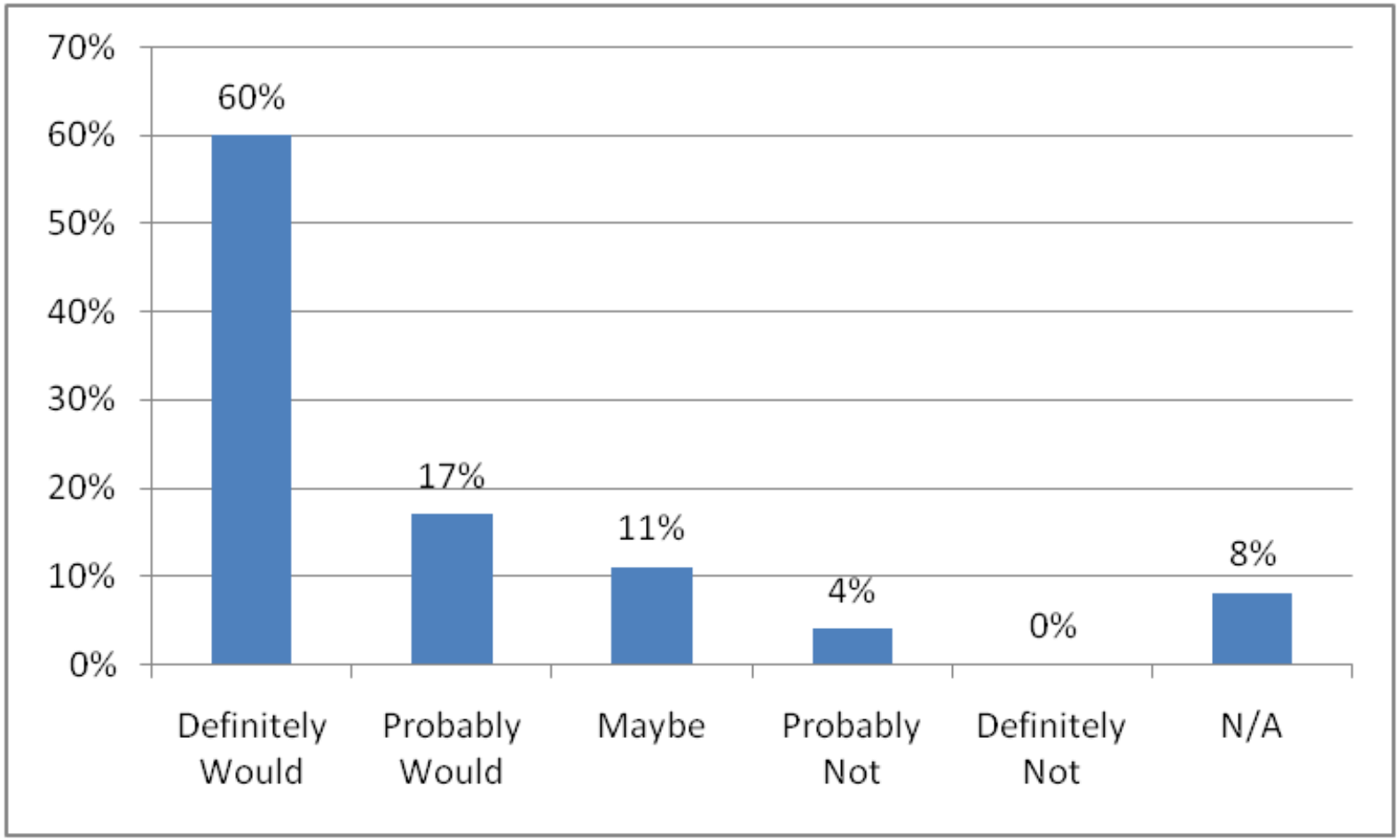
# Reasons Children Do Not use Personal FM Systems - Open Comments (verbatim):

- Children with newly activated cochlear implant
- District won't pay for them
- ASL instruction does not support the use of FM
- Not supported by the audiologist
- Bulky, can weigh down hearing aid to the point that it falls off easier and more often
- Would rather use sound field
- FM system interference in the building
- Sensory issues (sensitivity)

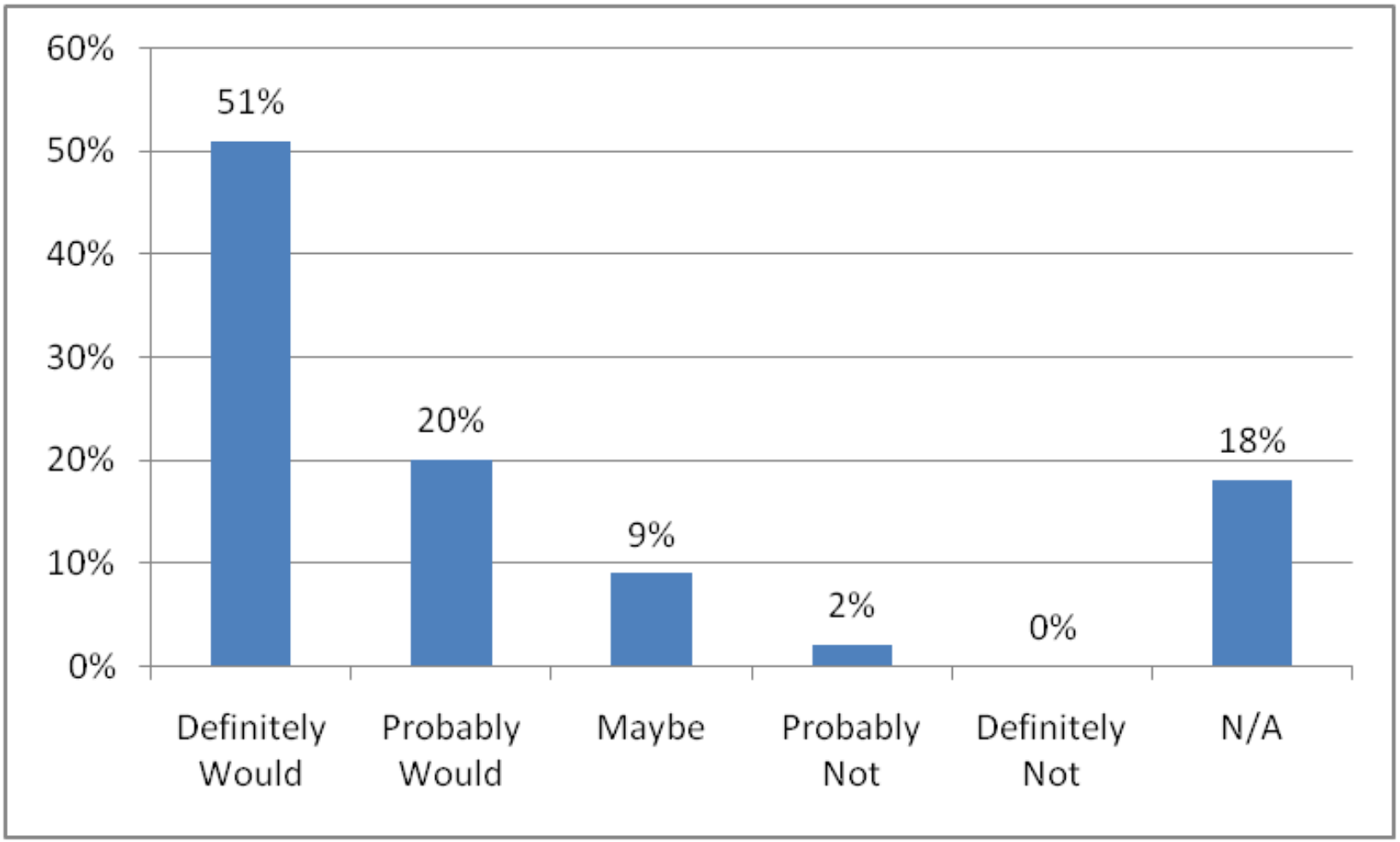
# Reasons Children Do Not use Personal FM Systems - Open Comments (verbatim):

- No speaking occurs
- We use ASL based instruction
- New CI device not yet supplied with FM
- With small class size and sound field, no need for personal FM
- Aide feeds in language from behind
- Not appropriate for children who use soft band BAHA
- With so few children in the class, I have very close contact with each child

# Recommend Sound Field?



# Recommend Personal FM?



# Audiology Support

- Do you do a daily check of the FM system?
  - Yes: 80%
  - No: 20%
- Is an audiologist available for support?
  - Yes: 88%
  - No: 12%
- If so, how long does it take to receive assistance?
  - Within hours: 83%
  - 1-3 days: 16%
  - 4-7 days: 0%
  - 1-2 weeks: 1%
  - 3+ weeks: 0%

# Audiology Support

- Audiology Information or Support Desired:
  - Educational information on advantages: 47%
  - Training on how FM systems work: 47%
  - Training on how to troubleshoot FM systems: 80%

# End of Survey Comments

- There are 3 students to 1 teacher of the deaf! We feel FM systems are not needed due to the close range the student/teacher work in. However, if a child's parent requested their child wear one to do so. We don't provided them within our school.
- I greatly prefer personal FM systems & would recommend them more than a SF system. We are working hard to get AL our students an auditory shoe. Hope to get them ASAP!
- Majority of current preschool population are CI users- too young to report if devices are malfunctioning.
- While I have no kids currently with FMs, I have in the past. It helps reduce voice strain (w/ soundfield) and the students all seem to pay better attention.
- Quite often FM systems interfere with outside frequencies and can cause intermittency or static. I find that this is a huge frustration for the student and the teacher. Because of these interferences, students sometimes do not wear, and thus, do not benefit.
- Although I do not serve any students who use personal FM systems this school year, I have in the past. My feelings on them are mixed: they are a fantastic devices that provide great benefits to students who are able to report static, intermittency, etc.
- This year we switched from an old analog FM system to the hearing aids with boots attached and it has been wonderful!  The kids are no longer distracted by the wires and the staff has more control over the system.

- Both the sound field and personal FM are an integral part of our program and are a high priority to our staff including our Audiologists.
- We worked with preK and K only an FM on a preschooler would need to be closely monitored by a professional, depending on maturity of listener- some may be able to provide proper feedback, other wouldn't. This is also a learned task.
- I believe the Educational Audiologists would do well to include American Sign Language as part of their requirements for graduation or certification. It would show that they serve also persons who are deaf but use ASL as their primary language even though many can and do benefit from amplification.
- Students in our programs use FM systems during speech if they do not have FM systems. SF is helpful to the speech department to provide amplification during assessment
- Our school has begun using ASL as the language of instruction. I am not sure how or when to use the FM during classroom time. I can see the value during individual or small group time when spoken English is used or during speech sessions.
- Would certainly benefit classrooms who voice more than use ASL
- It depends on the setting, the amount of background noise, how well the specific child seems to benefit from the system, etc.
- This approach may be appropriate for one on one correspondence or small group called oracy activity. It is not authentic approach.

- I consult with districts that have sound field and personal FM systems in use. I am a strong believer is FM. We have also loaned personal FM systems to students to use at home.
- FM/Soundfield devices, I believe, do significantly and positively impact the spoken language development (and subsequent academic performance) of students. The largest deterrent to consistent use is the difficulty in troubleshooting.
- My class has multiple special needs and therefore have a lot of 1-1 time while other students are in different activities so don't use the soundfield because each group is supposed to be paying attention to different things. I do use it for whole group instruction, but that only happens once or twice/day.
- I like my system!! The students enjoy using the handheld microphone also.
- Our preschool is very small and class sizes are usually two children to one teacher so we don't use FM systems here. For preschoolers that are mainstreamed I recommend sound field systems over personal FM systems unless the child has enough language to report when there is a problem.
- I probably would recommend a SF system for structured lessons only. I probably would not recommend a SF system if it is a well set-up preschool setting because a sound field system for the entire classroom does not work well because most of the time there are children in various learning centers doing various activities.
- Yes, FM system has definite benefits for preschool deaf children. Particularly during group learning activities. During free play or center time, not as beneficial. More CI are being used with a hearing aid on the other ear.

# References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## THANK YOU!